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PART V

ENVIRONMENTAL PROTECTION AGENCY

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GASOLINE-FUELED LIGHT-DUTY VEHICLES AND LIGHT-DUTY TRUCKS

Evaporative Emission Regulations

[6560-01]

Title 40—Protection of the Environment

CHAPTER I— ENVIRONMENTAL PROTECTION AGENCY

[FRL 915-3]

PART 86—CONTROL OF AIR POLLUTION FROM NEW MOTOR VEHICLES AND NEW MOTOR VEHICLE ENGINES: CERTIFICATION AND TEST PROCEDURES

Evaporative Emission Regulations for Light-Duty Vehicles and Trucks

AGENCY: Environmental Protection Agency.

ACTION: Final rule.

SUMMARY: This rulemaking increases the stringency of the fuel evaporative hydrocarbon (HC) emission standard for gasoline-fueled light-duty vehicles and light-duty trucks. Beginning with the 1981 model year the allowable level of evaporative HC emissions will be reduced from the current 6.0 grams per test standard to a 2.0 grams per test standard when measured via the sealed housing technique for evaporative determination (SHED) procedure. For certain Air Quality Control Regions which are expected to have difficulty meeting ambient air quality standards for oxidants, this action will reduce total hydrocarbon emissions by 3 to 10 percent in the year 1990.

EFFECTIVE DATE: October 23, 1978.

FOR FURTHER INFORMATION CONTACT:

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SUPPLEMENTARY INFORMATION: Fuel evaporative hydrocarbon emissions have been studied and measured since 1958. Federal control of evaporative emission levels was first proposed in the FEDERAL REGISTER (32 FR 2448) in 1967 when a novel and relatively untried measurement procedure, use of a vehicle enclosure, was proposed. These rules would have become effective for the 1969 model year. When the final rulemaking was published in 1968 (33 FR 8304), the novel measurement procedure was abandoned in favor of a better known procedure (carbon trap method) which utilizes the absorption of hydrocarbon on activated charcoal. The activated charcoal container is weighed before and after the test to determine the mass of hydrocarbon absorbed. Because of manufacturing lead time requirements, the implementation of the standards was delayed until the 1971 model year, and the emission level was set at 6.0 grams/test (g/test). The evaporative emission standard was reduced to 2.0 g/test for 1972 and subsequent model years.

The carbon trap method for measuring evaporative emissions has been found, through testing with a more accurate measurement method, to greatly underestimate actual evaporative emissions. The more accurate testing method was the Society of Automotive Engineers (SAE) recommended procedure for measuring evaporative emissions (SAE J171a) and involved collecting the evaporative emissions in a large sealed enclosure containing the test vehicle. Results from the 1972 EPA surveillance test program (as reported in Supplement No. 5 of AP-42) of "controlled" in-use vehicles indicated an average emission level of about 24 g/test by the vehicle enclosure method, 12 times the standard established for the carbon trap method. Thus, the amount of control thought to exist for evaporative emissions tested by the carbon trap method was not in actuality obtained.

On January 13, 1976, a notice of proposed rulemaking (NPRM) was published in the FEDERAL REGISTER (41 FR 2022), setting forth proposed amendments to Subparts A and B of Part 86 of the Code of Federal Regulations (CFR) to become effective with 1978 model year light-duty vehicles and light-duty trucks. The NPRM announced the Agency's intention to revise the evaporative emission test procedures (adopt the SHED procedure) and establish standards of 6.0 g/test for 1978 and 2.0 g/test for 1979 and subsequent model years.

Since publication of the NPRM, the proposed standards for 1978 and 1979 have been separated into two regulatory packages. This was done because lead-time for the 1978 regulations was critical; and the real risk of not being able to implement a 6.0 g/test standard for 1978, in order to analyze issues related to the 2.0 g/test standard, was not justified. Consequently, the final rulemaking published August 23, 1976 (41 FR 35626), contained the revised test procedure and a 6.0 g/test standard for the 1978 model year. It is expected that implementation of that standard, along with the new test procedure, will reduce evaporative hydrocarbon emissions from the equivalent of 1.76 g/mile to 0.60 g/mile. (Gram per mile equivalents for in-use vehicles were determined by calculating average gram per day values and dividing by the average travel per day. The gram per day value is the sum of diurnal and total hot soak emissions, as estimated in AP-42, Compilation of Air Pollution Emissions Factors.)

A more stringent evaporative standard of 2.0 g/test is now being promulgated for the 1981 model year for light-duty vehicles and light-duty trucks (0-8,500 pounds Gross Vehicle Weight Rating). The test procedures are unchanged from the 1978-80 model year regulations. The 2.0 g/test standard is expected to reduce evaporative hydrocarbon emissions of in-use vehicles from the equivalent of 0.60 g/mile to 0.15 g/mile. This action will reduce total nationwide mobile source hydrocarbon emissions by as much as 25 percent by the year 1990. For certain Air Quality Control Regions that are expected or have difficulty meeting the ambient air quality standards for oxidants, this action will reduce hydrocarbon emissions from all sources by about 0.9 million tons, or an average of about 6 percent in the year 1990. Oxidant air quality will be improved by about 2 percent in these regions.

It is estimated that this regulation will cost purchasers of new light-duty vehicles or trucks between $1 and $5.50. The expense is primarily incurred as higher vehicle costs to pay for installation or modification of control system components necessary to meet the new evaporative emission standard. The impact of the vehicle cost increase, however, is anticipated to have a negligible adverse effect on sales of the manufacturers (less than 0.15 percent). No costs due to increased fuel consumption or maintenance are expected. Nor is the cost of certification that the government and the manufacturers must bear expected to increase significantly. Over a 5 year period (1981-1985), the aggregate cost of compliance is expected to be $79 million to $400 million.

This action will provide improved air quality at a cost of between $20 and $100 per ton of hydrocarbon removed. As a comparison, the cost-effectiveness of reducing automotive exhaust emissions from the current standard (1.5 g/mile) to the statutory standard (0.41 g/mile) is between $500 and $1,400 per ton of hydrocarbon removed. This additional control of evaporative emissions is one of the more cost effective means available for reducing hydrocarbon emissions.

Comments in regard to a 2.0 g/test standard were received from many motor vehicle manufacturers and from several other interested parties as part of their comments to the NPRM which proposed a change to the SHED test procedure and the implementation of a 6.0 g/test standard in 1978 and a 2.0 g/test standard in 1979. The major issues concerning a 2.0 g/test standard have been summarized here. A complete analysis of comments on

all issues related to the 2.0 g/test standard has been prepared and is available for public review. Comments which pertain to the test procedure have already been summarized in regulations for the 1978 model year.

MAJOR ISSUES

FEASIBILITY AND LEAD TIME REQUIREMENTS OF A 2.0 G/TEST STANDARD

No automotive manufacturer stated that it could meet the 2.0 g/test standard for the 1979 model year. In fact, nearly all manufacturers stated that a 2.0 g/test standard in 1979 as originally proposed was infeasible. Several manufacturers requested that more than 1 year be allowed between implementation of a 6.0 g/test and a 2.0 g/test standard.

The manufacturers identified four major problem areas connected with the implementation of a 2.0 g/test standard. These problem areas are (1) test variability, (2) vehicle background (i.e., nonfuel) emissions, (3) technical ability to reduce emissions from vehicles with stabilized background to a level required for certification, and (4) lead time for equipment definition, development and production.

In regard to test variability, an evaporative emissions crosscheck test program between the EPA and the four major U.S. automobile manufacturers showed that test variability at the 2 g/test level is no greater than variability of exhaust emission testing. Data supplied by manufacturers at the waiver hearing for the State of California's 2.0 g/test standard also support this conclusion. Therefore, variability is not a serious problem associated with certifying vehicles to a 2.0 g/test SHED evaporative standard.

The issue of background emissions has already been discussed in the preamble to the August 23, 1976 final rulemaking referred to earlier. EPA will use the same test procedure for the 2.0 g/test standard. Manufacturers will be allowed to minimize background emissions from test vehicles in any way (e.g., accelerated aging, sand blasting, removing upholstery, etc.) which does not violate provisions of the regulations. The emission measurements will include any remaining vehicle background level. The manufacturer is also allowed to conduct repeat testing (and additional background lowering procedures) to gain assurance that the evaporative emissions have stabilized before bringing the vehicle to EPA for certification testing.

The options available to manufacturers for reducing background emissions on certification test vehicles may not be available or viable when testing in-use or assembly line vehicles. Assembly line vehicles would require analytical procedures, yet to be specified, to enable fuel evaporative emissions to be distinguished from the high background emissions from nonfuel sources. In-use vehicles would not normally be tested before they are a year or more older, thus their background emissions can reasonably be expected to have stabilized and should properly be the responsibility of the manufacturer. The only additional preconditioning for these vehicles would be the removal of spilled or leaked oil, and miscellaneous deposits of road oils.

In regard to the third problem area identified above, the manufacturers have stated that it has not been demonstrated that all vehicles can be produced to meet a 2.0 g/test standard. They stated that, due to test variability, the design goal must be 1.4 g/test or less. However, the test-to-test and lab-to-lab variability obtained in an EPA-manufacturer crosscheck program indicates that a vehicle with a true mean level of 1.9 g/test (assuming no deterioration) would pass a 2.0 g/test standard with a 90 percent confidence level, and several production and modified vehicles have given test results of 1.9 g/test and less. EPA agrees that the ability to reduce evaporative emissions to less than 2.0 g/test has not been demonstrated on all vehicles. However, enough data (mainly from automotive manufacturers, a test program conducted by Exxon Research & Engineering Co., and emission certification vehicles tested using the SHED procedure) have been generated to demonstrate that it is technically feasible, and additional industry effort should be able to define the required equipment for essentially all vehicles by the 1981 model year. Perhaps the strongest indicator or technical feasibility of a 2.0 g/test standard is the number of 1978 certification emission data vehicles which have given evaporative emission results of 2.0 g/test or less. As of September 27, 1977, 597 valid evaporative emission tests had been conducted on 1978 model year certification vehicles at the EPA testing laboratory. Of the 597 tests, 225 (or 38 percent) were less than 2.0 grams. These are the evaporative emission levels from vehicles which were designed to comply with a 6.0 g/test standard.

Late in the development of this final rule, General Motors filed a petition with the Agency recommending that the EPA establish for light-duty trucks with gross vehicle weight ratings (GVWR) between 0 and 6,000 pounds the same standard as is set for passenger cars, and that a standard 1 gram higher be established for trucks with GVWR's between 6,000 and 8,500 pounds. In their petition, GM claimed they have not yet developed the requisite technology to certify at the 2.0 g/test level the heavier light-duty trucks (GVWR's between 6,000 and 8,500 pounds) and particulary those trucks equipped with optional large capacity fuel tanks (40 as opposed to the nominal 20 gallon tank).

The Agency disagrees that a 2.0 g/test standard is not achievable for trucks up to 8,500 pounds GVWR. Recent data from the 1979 certification program indicate that 37 evaporative emission tests were performed on light-duty trucks 6,000-8,500 pounds GVWR and of these 11 were below the 2.0 g/test level. As with the 1978 certification data referred to earlier, the light-duty trucks tested were designed to meet a 6.0 g/test standard, and yet a sizable portion achieved the 2.0 g/test level. In addition, a representative of GM's major competition in the light truck market, the Ford Motor Co., has indicated that if a 2.0 g/test standard were to be promulgated for the 1981 model year, Ford would be able to certify its light-duty trucks to the standard. This includes those equipped with the optional large capacity fuel tanks which GM has claimed they might not be able to offer as optional equipment if this standard were promulgated (currently installed on approximately 25 percent of trucks under 8,500 pounds GVWR sold by GM.)

As part of its petition to the Agency to consider their alternative to a 2.0 g/test standard for all light-duty trucks, GM submitted technical arguments to support their contention that they have encountered several problems inherent to light-truck design and operation which they have not yet resolved and which make it difficult to achieve the 2.0 g/test level. GM has attributed the cause of these technical difficulties to large fuel tanks, high fuel system temperatures, and background emissions. The issue of background emissions also was a concern raised about the 6.0 g/test standard. Other manufacturers discussed it in their comments on the 2.0 g/test standard. A summary of these concerns and the Agency's response to them can be found in the "Summary and Analysis of Comments to the NPRM—Revised Evaporative Emission Regulations for Light-Duty Vehicles and Light-Duty Trucks (2 gram/test standard)." A separate document was prepared to discuss the other issues raised by GM and is entitled "Comments on 'General Motors Commentary to the Environmental Protection Agency on Evaporative Emission Standards for Trucks' ", dated May 10, 1978. GM technical representatives also met with EPA staff on May 12, 1978 to discuss evaporative emission control for light-duty trucks. A summary of this meeting can be found in a memo entitled "Meeting with General Motors in Regard to Evaporative Emission

Standard for Trucks", dated May 18, 1978. Copies of all these documents are on file at the EPA Public Information Reference Unit, Room 2922, 401 M Street SW., Washington, D.C.

In light of GM's concern about evaporative emission control capabilities for light-duty trucks, the Agency has reexamined its own data on evaporative emissions from light-duty trucks, the new information submitted by GM, and the comments from other manufacturers on this subject. Based on its review of the information available to it at this time, the Agency is unable to agree that the technical concerns posed by GM represent such a unique and significant problem for controlling evaporative emissions from light-duty trucks that manufacturers will be unable to overcome them and achieve a level of control sufficient to certify a 2.0 g/test standard. Therefore, the Agency sees no benefit to granting the GM petition to establish the same standard for light-duty vehicles and light-duty trucks up to 6,000 pounds GVWR, and a standard 1 g/test higher than that level for those trucks in the 6,000 pound to 8,500 pound GVWR category.

Since it appears that some manufacturers still require additional time for equipment definition, design, development, tooling and production, the originally proposed 1979 implementation date is impossible. A 1980 model year implementation date also appears to be unachievable for some manufacturers. While a few manufacturers (e.g., Ford Motor Co.) have made substantial progress in developing evaporative emission control systems capable of meeting a 2.0 g/test standard, others have not effectively used the time since publication of the NPRM to develop such systems. For example, at the May 12, 1978 meeting with EPA staff, GM representatives stated that they had not yet defined an adequate control system for their large fuel capacity light-duty trucks. For such manufacturers to equip their vehicles in an attempt to meet a 2.0 g/test standard by 1980, would now require an all-out crash project effort. Not only might this effort fail, many of the resulting systems may not be optimized in regards to cost and performance. A later implementation date should allow manufacturers to optimize their systems by, for example, developing hot soak control measures which will not require the use of equipment needing periodic replacement, such as engine air filters. In view of these factors, the 2.0 g/test standard is being promulgated for the 1981 model year.

Cost of a 2.0 g/test standard. In their comment to the NPRM, only three vehicle manufacturers gave cost estimates for control systems which would allow current production vehicles to meet a 2.0 g/test standard. These three manufacturers were Chrysler, Nissan and Toyota and their estimates were $50, $30.30 and $18-$23 respectively.

The increase in vehicle retail price estimated by Chrysler ($50) was much higher than what will be necessary to control SHED evaporative emissions to 2.0 g/test. Tests have been conducted under EPA contract on a vehicle equipped with the engine (440 CID) which this manufacturer indicated is its most difficult to control. The evaporative emissions from this vehicle (including vehicle background) were controlled to an average level of 1.9 g/test for an EPA-estimated retail price increase of $6. It is also believed that more than the necessary amount of equipment has been included in the estimated price from Nissan; however, definitive test information on modifications to Nissan vehicles is not available. Toyota estimated the total cost to comply with the 6.0 g/test standard for 1978 at $13 per vehicle and the 2 g/test standard as $18-$23. Therefore, its estimated cost of going from the 6.0 g/test system to a 2.0 g/test system is $5-$10. As of September 27, 1977, 24 valid certification tests had been conducted on 1978 Toyota certification vehicles. Of these 24, 20 gave results of less than 1.8 g/test, so it appears that most Toyota vehicles will not require further modification to comply with the 2.0 g/test standard.

In a test program conducted by Exxon Research & Engineering Co., six typical production vehicles manufactured by six different manufacturers were modified to give total SHED evaporative emission levels of below 2.0 g/test. The EPA estimated cost of modifying the individual vehicles ranged from $1.60 on a Ford to $25 on a Mazda (1976 dollars). From this work the estimated U.S. sales-weighted increase in vehicle retail price is $1 over vehicles designed to meet the 6.0 g/test standard in 1978. Based on the estimated costs of manufacturer-developed and tested systems which have given SHED evaporative results of less than 2.0 g/test, the U.S. sales-weighted increase in vehicle retail price is $5 over vehicles designed to meet a 6.0 g/test standard for 1978. It is expected that the actual increase in retail price of 1981 model vehicles due to implementation of the 2.0 g/test standard will be between these two values, i.e., between $1 and $5 per vehicle. In 1978 dollars the estimated range of costs is between $1 and $5.50 per vehicle.

Durability requirement. Durability procedures for the current 6.0 g/test standard require that manufacturers determine system durability using test methodologies which they have established. Manufacturers submit durability test plans in their part I applications for certification, and provide the data from the test programs and resultant deterioration factors for each evaporative emission family in the part II application. A study is currently planned which would thoroughly review and analyze the deterioration determination methodologies which the manufacturers have used. The study would also consider other methods of establishing system durability. The purpose of this work is to develop a viable durability test procedure which could be required of all manufacturers. It is likely, however, that this study will not begin during this fiscal year; and therefore, will not be completed in time for its results to be used in specifying a durability test procedure for the 1981 model year. Consequently, the current requirements for durability testing will remain in effect for the 1981 model year and until such time that an appropriate standardized test procedure can be specified.

Comments which were received in response to the NPRM, EPA's Summary and Analysis of Comments Received to the NPRM, and the final environmental impact statement are available for inspection and copying during normal business hours at the U.S. Environmental Protection Agency, Public Information Reference Unit, Room 2922 (EPA Library) 401 M Street SW., Washington, D.C. 20460. As provided in 40 CFR Part 2, a reasonable fee may be charged for copying services.

NOTE.—The Environmental Protection Agency has determined that this document does not contain a major proposal requiring preparation of an economic impact analysis under Executive Orders 11821 and 11949 and OMB Circular A-107.

Dated: August 15, 1978.

DOUGLAS M. COSTLE,
Administrator.

40 CFR Part 86 is amended as follows.

Subpart A—General Provisions for Emission Regulations for 1977 and Later Model Year New Light-Duty Vehicles, 1977 and Later Model Year New Light-Duty Trucks, and for 1977 and Later Model Year New Heavy-Duty Engines

1. A new § 86.081-8 is added to read as follows:

§ 86.081-8 Emission standards for 1981 light-duty vehicles.

(a)(1) Exhaust emissions from 1981 and later model year light-duty vehicles shall not exceed:

(i) *Hydrocarbons.* 0.41 gram per vehicle mile;

(ii) *Carbon monoxide.* 3.4 grams per vehicle mile;

(iii) *Oxides of nitrogen.* 1.0 gram per vehicle mile.

(2) The standards set forth in paragraph (a)(1) of this section refer to the exhaust emitted over a driving schedule as set forth in subpart B of this part and measured and calculated in accordance with those procedures.

(b)(1) Fuel evaporative emissions from 1981 and later model year gasoline-fueled light-duty vehicles shall not exceed:

(i) *Hydrocarbons.* 2.0 grams per test.

(2) The standard set forth in paragraph (b)(1) of this section refers to a composite sample of the fuel evaporative emissions collected under the conditions set forth in subpart B of this part and measured in accordance with those procedures.

(c) No crankcase emissions shall be discharged into the ambient atmosphere from any 1981 and later model year gasoline-fueled light-duty vehicle.

2. A new § 86.081-9 is added to read as follows:

§ 86.081-9 Emission standards for 1981 light-duty trucks.

(a)(1) Exhaust emissions from 1981 and later model year light-duty trucks shall not exceed:

(i) *Hydrocarbons.* 1.7 grams per vehicle mile;

(ii) *Carbon monoxide.* 1.8 grams per vehicle mile;

(iii) *Oxides of nitrogen.* 2.3 grams per vehicle mile.

(2) The standards set forth in paragraph (a)(1) of this section refer to the exhaust emitted over a driving schedule as set forth in subpart B of this part and measured and calculated in accordance with those procedures.

(b)(1) Evaporative emissions from 1981 and later model year gasoline-fueled light-duty trucks shall not exceed:

(i) *Hydrocarbons.* 2.0 grams per test.

(2) The standard set forth in paragraph (b)(1) of this section refers to a composite sample of the evaporative emissions collected under the conditions set forth in subpart B of this part and measured in accordance with those procedures.

(c) No crankcase emissions shall be discharged into the ambient atmosphere from any 1981 and later model year gasoline-fueled light-duty truck.

(Secs. 202, 301(a), Clean Air Act, as amended (42 U.S.C. 7521 and 7601, formerly 42 U.S.C. 1857f-1 and 1857g(a) which was reclassified by 91 Stat. 685 (August 7, 1977)).)

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